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NOTES ON GEOGRAPHIC DISTRIBUTION

Amphibia, Anura, Calyptocephalellidae, *Telmatobufo bullocki* Schmidt, 1952: Distribution extension, habitat use and geographic distribution map

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ABSTRACT: We report a new locality for *Telmatobufo bullocki*, a critically endangered amphibian endemic of Chile. This new location, Los Queules National Reserve, has high relevance on the conservation of this species because is the only known population in a protected area north of the Bío Bío River, situated in a region deeply modified for forestry and agriculture. Also, we included habitat descriptions and a detailed distribution map with all reported localities.

Chile is located in southwestern South America and is biogeographically isolated from other South American countries by the Andes mountain range in the east and the dry Atacama desert in the north. Isolation has contributed to the high level of endemism. Among amphibians, 60.3 % of species are endemic (35 out of 58; Díaz-Páez *et al.* 2008; Vidal *et al.* 2008). There are also three genera (*Calyptocephalella*, *Insuetophrynus* and *Telmatobufo*) and one endemic family (Calyptocephalellidae; Ortiz and Díaz-Páez 2006; Correa *et al.* 2008). Phylogenetic studies have shown that the Calyptocephalellidae is the sister group of Australasian amphibians (Correa *et al.* 2006; Frost *et al.* 2006) and may constitute a relict lineage of Gondwanan origin, represented by four species of the genera *Calyptocephalella* and *Telmatobufo* (Correa *et al.* 2008; Frost 2009). All species of the family Calyptocephalellidae are threatened with extinction (IUCN 2009). Two of the three species of the genus *Telmatobufo*, *T. bullocki* and *T. venustus*, are classified as critically endangered because their area of occupancy is probably less than 500 km^2, their habitat is declining in extent and quality and population declines have been reported (IUCN 2009).

The known distribution of *T. bullocki*, until 2005, was restricted to the Nahuelbuta range between Lota and Elicura in southwestern Chile (37°05'13" S, 73°09'21" W and 38°00'00" S, 73°21'09" W, Formas *et al.* 2001). Later, the range was extended approximately 150 km northwards (36°15'00" S, 72°31'00" W, 12 km W of Quirihue, Escobar *et al.* 2005). This new record is outstanding because the population is located north of the Bio Bío River, which is an important biogeographical barrier in the area (Figure 1). However, this new record has not been updated in Chilean amphibian and conservation databases (Veloso 2006; Veloso *et al.* 2004, in IUCN 2009). Moreover, Veloso *et al.* (2004) shows that this specie was found in less than five localities, which disagrees with the information given by Formas *et al.* (2001), where nine localities are specified.

In this work we report a new locality for *T. bullocki*, outside of the Nahuelbuta range. We also include habitat descriptions and an up-to-date distribution map. Our finding extends the northern limit of the distribution of *T. bullocki* approximately 30 km northwest from the report of Escobar *et al.* (2005). This new record, located in Los Queules National Reserve, is the second population situated north of the Bio Bío River, an area where the original forest cover currently is restricted to small and isolated remnants (Smith-Ramírez 2004). Moreover, it is the second protected area where this specie is found (200 km north of Nahuelbuta National Park).

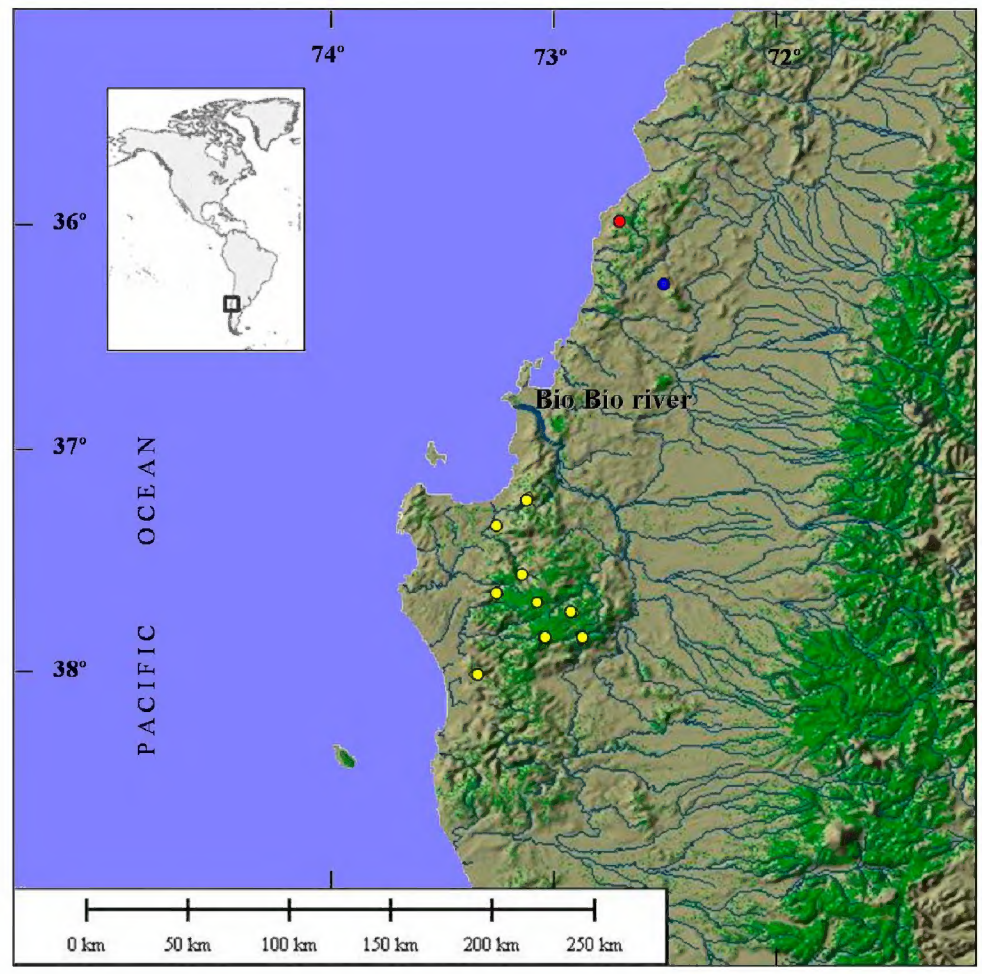

FIGURE 1. Distribution map of *Telmatobufo bullocki*. Native forest remnants are in green and rivers in blue. The red dot correspond to Los Queules National Reserve (new record), the blue dot indicates the previous northernmost record (Escobar et al. 2005) and the yellow dots the nine localities reported by Formas et al. (2001).

In October 2006 and May 2007 we found two individuals of *T. bullocki* at Los Queules National Reserve (35°58'46" S, 72°41'15" W, at 500 m a.s.l., Figure 1), during arthropods surveys in the zone. This is a small protected area (147 ha) located in the Maulino Deciduous Forest (Gajardo 1994). This new record highlights the importance of this reserve for the conservation of local biodiversity and should encourage future studies in this area (Smith-Ramírez 2004).

The individual captured in October 2006 was photographed and then released. Using a coin as reference measurement, we estimated that it was approximately 64 mm long (snout-vent). The individual captured in May 2007 was measured and a tissue sample was collected for genetic analysis in order to discriminate this species from *T. venustus,* which inhabit a similar latitudinal range in the Andes Mountains. A morphometric comparison with the diagnostic and other measurements made by Formas *et al.* (2001) is shown in Table 1.

Other diagnostic characters are: developed postfemoral skin ridge, thick tarsal fold, dorsal skin attached to the body, interocular yellow band, vertical pupil, back and limbs brown with yellow filigree between dorsal granules, and abdomen yellowish brown with dark blotches (Figure 2).

FIGURE 2. Adults of *Telmatobufo bullocki* from Los Queules National Reserve, Maule Region, Chile. Top) October 2006, Bottom) May 2007. Photos N. Lagos.

A fragment of the mitochondrial gene 16S was sequenced and compared with sequences of the genus available in GenBank. Primers and PCR protocol are detailed in Correa *et al.* (2006). A segment of 483 pair of bases was obtained and deposited in GenBank (accession number GQ994987). Analysis of an alignment of 479 sites (segments with indels were excluded) reveals a 1.04 % difference with *T. bullocki* found in Caramávida, Nahuelbuta range (accession number DQ864565), and 3.55 % with *T. venustus*, of Altos de Vilches (accession number DQ864566). Although we have no more intraspecific genetic data for these species, the higher divergence between *T. bullocki* and *T. venustus*, along with the morphological characters, allow us to confirm the specific identity of the specimen from Los Queules.

Telmatobufo bullocki is highly adapted to lotic habitats and can be found in the mountains of the Chilean coastal range between the 35°58'46" S and 38°00'00" S, between 10 – 800 m a.s.l. (Formas *et al.* 2001; Escobar *et al.* 2005; this report, Figure 1). This mountain system was originally covered by temperate forests from approximately 35° S southwards. Nowadays, these forests subsist as isolated fragments surrounded by commercial pine plantations and agricultural lands (Smith-Ramírez 2004, Echeverría *et al.* 2006). *Telmatobufo bullocki* inhabits mountainous streams surrounded by dense vegetation, and has been found under fallen logs and stones in *Nothofagus* forests (Formas *et al.* 2001; Rabanal and Nuñez 2008). However, it is possible to found *T. bullocki* in more altered habitats. Escobar *et al.* (2005) found an individual of *T. bullocki* in a *Pinus radiata* plantation in winter, 90 meters from the native forest. In our case, the individuals were found during the day, walking in a native forest with high slope (57°), near pine plantations (10 m and 100 m away) and more than 300 m from streams, in spring and autumn.

This discovery provides some new directions for the conservation of this endangered species. Chilean Native Forest Law (Ministerio de Agricultura 2008) protects vegetation surrounding watercourses, therefore protects indirectly amphibian species living in or adjacent to streams. With *T. bullocki* inhabiting sites far away from the water during their non-reproductive season they are susceptible to accidental death through commercial plantation management. Plantation management that might threaten this species includes application of herbicides and fertilizers and mechanical disturbance during harvesting and thinning operations. If *T. bullocki* depends on upland habitat for surviving between breeding seasons, then substantially wider buffers of native forest may be needed than are currently provided for in the legislation. Key areas of future research are to discover if the species is able to survive the non-breeding season in plantations just as effectively as it does in native forest, and to understand the impacts of plantation management on over-wintering frogs.

Table 1. Morphometrics of captured *T. bullocki* and reported in literature.

Morphometric measurements (mm)	Formas *et al.* 2001 (rank)	N. R. Los Queules individual
Diagnostic		
Snout-vent distance	61.8 – 83	79
(Paratoid gland/ anteroposterior diameter of the eye) ratio	1.3	1.3
Other		
Head length	22.7 – 28	23.6
Head width	23.5 – 30	28.2
Tibia length	27 – 38	35
Parotoid gland length	8.2 – 12.4	13.3

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